

## Appendix C.

### Matrix of Pathways and Indicators

WRIA 8 Reconnaissance Assessment Workshop Matrix					
PATHWAY	INDICATORS	Properly functioning		At risk	Not properly functioning
		50-57° F <sup>1</sup>	< 12% fines (<0.85mm) in gravel <sup>3</sup> , turbidity low	57-60° (spawning) 57-64° (migration & Rearing) <sup>2</sup>	12-17% (west-side) <sup>3</sup> , 12-20% (east-side) <sup>2</sup> , turbidity moderate
Water Quality:	Temperature				
	Sediment/Turbidity				
	Chemical Contamination/ Nutrients		low levels of chemical contamination from agricultural, industrial, and other sources, no excess nutrients, no CWA 303d designated reaches <sup>5</sup>	moderate levels of chemical contamination from agricultural, industrial, and other sources, some excess nutrients, one CWA 303d designated reach <sup>5</sup>	high levels of chemical contamination from agricultural, industrial, and other sources, high levels of excess nutrients, more than one CWA 303d designated reach <sup>5</sup>
Habitat Access:	Physical Barriers		any man-made barriers present in watershed allow upstream and downstream fish passage at all flows	any man-made barriers present in watershed do not allow upstream and/or downstream fish passage at base/low flows	any man-made barriers present in watershed do not allow upstream and/or downstream fish passage at a range of flows
Habitat Elements:	Substrate		dominant substrate is gravel or cobble (interstitial spaces clear), or embeddedness <20% <sup>3</sup>	gravel and cobble is subdominant, or if dominant, embeddedness 20-30% <sup>3</sup>	bedrock, sand, silt, or small gravel dominant, or if gravel and cobble dominant, embeddedness >30% <sup>2</sup>

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	Large Woody Debris  <b>Survey data:</b> min. diameter used = 8", minimum length = 6.5ft.	Coast: >80 pieces/mile (50/km) >24" (6) diameter >50 ft. length <sup>4</sup> ; East-side: >20 pieces/mile >12" diameter >35 ft. length <sup>2</sup> ; and adequate sources of woody debris recruitment in riparian areas	currently meets standards for properly functioning, but lacks potential sources from riparian areas of woody debris recruitment to maintain that standard	does not met standards for properly functioning and lacks potential large woody debris recruitment
	Pool Frequency  <b>Survey data:</b> Juanita Creek average width = 20"	meets pool frequency standards (left) and large woody debris recruitment standards for properly functioning habitat (above)  <u>channel width</u> <u>#pools/mile<sup>6</sup></u> 5 feet ... 184 10" ..... 96 15" ..... 70 20" ..... 56 25" ..... 47 50" ..... 26 75" ..... 23	meets pool frequency standards but large woody debris recruitment inadequate to maintain pools over time	does not meet pool frequency standards
	Pool Quality  <b>Survey data:</b> PQI	pools >1 meter deep (holding pools) with good cover and cool water <sup>3</sup> , minor reduction of pool volume by fine sediment	few deeper pools (>1 meter) present or inadequate cover/temperature <sup>3</sup> , moderate reduction of pool volume by fine sediment	no deep pools (>1 meter) and inadequate cover/temperature <sup>3</sup> , major reduction of pool volume by fine sediment
	Off-Channel Habitat	backwaters with cover, and low energy off-channel areas (ponds, oxbows, etc.) <sup>3</sup>	some backwaters and high energy side channels <sup>3</sup>	few or no backwaters, no off-channel ponds <sup>3</sup>
	Refugia (important remnant habitat for sensitive aquatic species)	habitat refugia exist and are adequately buffered (e.g., by intact riparian reserves); existing refugia are sufficient in size, number, and connectivity to maintain viable populations or sub-populations <sup>7</sup>	habitat refugia exist but are not adequately buffered (e.g., by intact riparian reserves); existing refugia are insufficient in size, number, and connectivity to maintain viable populations or sub-populations <sup>7</sup>	adequate habitat refugia do not exist <sup>7</sup>

PATHWAY	INDICATORS	Properly functioning	At risk	Not properly functioning
Channel Condition & Dynamics:	Width/Depth Ration	<10 <sup>2, 4</sup>	10-12 (we are unaware of any criteria to reference)	>12 (we are unaware of any criteria to reference)
Survey data	Streambank Condition	>90 % stable; i.e., on average, less than 10% of banks are actively eroding <sup>2</sup>	80-90% stable	<80% stable
Survey data	Floodplain Connectivity	off-channel areas are frequently hydrologically linked to main channel; overbank flows occur and maintain wetland functions, riparian vegetation and succession	reduced linkage of wetland, floodplains, and riparian areas to main channel; overbank flows are reduced relative to historic frequency, as evidenced by moderate degradation of wetland function, riparian vegetation/succession	severe reduction in hydrologic connectivity between off-channel wetland, floodplain, and riparian areas; wetland extent drastically reduced and riparian vegetation/succession altered significantly
Flow-Hydrology:	Change in Peak/Base Flows	watershed hydrograph indicates peak flow, base flow, and flow timing characteristics comparable to an undisturbed watershed of similar size, geology, and geography	some evidence of altered peak flow, baseflow, and/or flow timing relative to an undisturbed watershed of similar size, geology, and geography	pronounced changes in peak flow, baseflow, and/or flow timing relative to an undisturbed watershed of similar size, geology and geography
	Increase in Drainage Network	zero or minimum increases in drainage network density due to roads <sup>8, 9</sup>	moderate increases in drainage network density due to roads (e.g., = 5%) <sup>8, 9</sup>	significant increases in drainage network density due to roads (e.g., = 20-25%) <sup>8, 9</sup>

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Watershed Conditions:	Road Density & Location	<2mi.mi <sup>2</sup> , <sup>11</sup> no valley bottom roads	2-3- mi/mi <sup>2</sup> , some valley bottom roads	>3 mi/mi <sup>2</sup> , many valley bottom roads
	Disturbance History	<15% ECA (entire watershed) with no concentration of disturbance in unstable or potentially unstable areas, and/or refugia, and/or riparian area; and for NWFP area (except AMAs), ≥15% retention of LSOG in watershed <sup>10</sup>	<15% ECA (entire watershed) but disturbance concentrated in unstable or potentially unstable areas, and/or refugia, and/or riparian area; does not meet NWFP standard for LSOG retention	<15% ECA (entire watershed) but disturbance concentrated in unstable or potentially unstable areas, and/or refugia, and/or riparian area; does not meet NWFP standard for LSOG retention
	Riparian Reserves	the riparian reserve system provides adequate shade, large woody debris recruitment, and habitat protection and connectivity in all sub-watersheds, and buffers or includes known refugia for sensitive aquatic species (>80% intact), and/or for grazing impact	moderate loss of connectivity or function (shade, LWD recruitment, etc.) of riparian reserve system, or incomplete protection of habitats and refugia for sensitive aquatic species (=70-80% intact), and/or for grazing impacts: percent similarity of riparian	riparian reserve system is fragmented, poorly connected, or provides inadequate protection of habitats and refugia for sensitive aquatic species (<70% intact), and/or for grazing impacts: percent similarity of riparian vegetation to the potential natural